

Barsky et al.

doc. 12-1268

AMENDMENT TO THE CLAIMS OF SN 10/692,390

Please amend the claims as follows:

1(Previously amended). The method of parsing a wafer of crystalline material into multiple pieces comprising the steps of:

forming a unitary assembly of said wafer, a thermoplastic material, and a support surface, said thermoplastic material adhering to both said wafer and said support surface and said support surface being of a size that covers a side of said wafer;

sawing through said wafer and thermoplastic material in a predetermined pattern in the outline of said multiple pieces to cut said multiple pieces and the thermoplastic material underlying each of said multiple pieces out of said wafer, leaving said multiple pieces individually attached to said support surface by respective pieces of thermoplastic material; and

removing said thermoplastic material, leaving said multiple pieces disposed on said support surface.

2(original). The method of parsing a wafer of crystalline material into multiple pieces as defined in claim 1, further comprising the step of directing a stream of coolant fluid onto said wafer during said step of sawing through said wafer and thermoplastic material.

3(original). The method of parsing a wafer of crystalline material into multiple pieces as defined in claim 1, wherein said step of removing said thermoplastic material further comprises the step of chemically dissolving said thermoplastic material.

4(original). The method of parsing a wafer of hard crystalline material into multiple pieces as defined in claim 1, wherein said multiple pieces of said wafer possess an aspect ratio of 2 to 1 or greater.

Barsky et al.

doc. 12-1268

5(original). The method of parsing a wafer of crystalline material into multiple pieces as defined in claim 1, wherein said wafer comprises a material having a hardness of 8.0 Mohs or greater.

6(original). The method of parsing a wafer of crystalline material into multiple pieces as defined in claim 5, wherein said material of said wafer comprises sapphire.

7(original). The method of parsing a wafer of crystalline material into multiple pieces as defined in claim 1, further comprising the step of:

covering a surface of said wafer with a protective layer prior to said step of forming said unitary sandwich.

8(original). The method of parsing a wafer of crystalline material into multiple pieces as defined in claim 7, wherein said protective layer comprises a photoresist.

9(currently amended). The method of parsing a wafer of crystalline material into multiple pieces, said crystalline material having a hardness of 8 Mohs or greater and said multiple pieces having said wafer possess an aspect ratio of 2:1 or greater, comprising the steps of:

covering one side of said wafer with a layer of protective material material;

forming a unitary assembly of said wafer, a thermoplastic material, and a support surface, said thermoplastic material adhering to both said wafer and said support surface and said support surface being of a size that covers a side of said wafer;

sawing through said wafer and thermoplastic material in a predetermined pattern in the outline of said multiple pieces and simultaneously directing a stream of coolant fluid onto said wafer to cut said multiple pieces and the thermoplastic material underlying each of said multiple pieces out of said wafer, leaving said multiple pieces attached individually attached to said support surface by respective pieces of thermoplastic material;

chemically dissolving said layer of protective material;

Barsky et al.

doc. 12-1268

chemically dissolving said thermoplastic material, leaving said multiple pieces disposed on said support surface; and

removing said multiple pieces from said support surface.

10(Currently amended). The method of removing individual semiconductor chips from a semiconductor wafer containing a plurality of semiconductor chips integrally formed on one side of the wafer with the semiconductor chips arranged in a plurality of cells defined by a cross-hatched grid of straight saw lines on said one side of said wafer, comprising the steps of:

applying a protective coating over the one side of said semiconductor wafer containing said plurality of semiconductor chips, said protective coating comprising a photoresist;

attaching the other side of said semiconductor wafer to a carrier substrate using thermoplastic material as an adhesive;

sawing the wafer along each of said straight saw lines through the depth of said thermoplastic material to form a plurality of rectangular ~~pieces~~ semiconductor chips individually attached to said carrier substrate by a respective portion of said thermoplastic material while concurrently directing a stream of coolant fluid at the blade of the sawing saw and onto said semiconductor wafer;

removing said protective coating;

removing said thermoplastic material from beneath said individual rectangular semiconductor chips while leaving said rectangular semiconductor chips in place on said carrier substrate; and

individually removing said ~~pieces~~ semiconductor chips from said carrier substrate.

Barsky et al.

doc. 12-1268

11(original). The method of removing individual semiconductor chips from a semiconductor wafer as defined in claim 10, wherein said step of applying a protective coating over the one side of said semiconductor wafer comprises the step of:

applying a layer of photoresist over the one side of said semiconductor wafer, said photoresist having a transparent or translucent optical characteristic sufficient to permit observation of said saw lines on said side of said semiconductor wafer.

12(original). The method of removing individual semiconductor chips from a semiconductor wafer as defined in claim 10, wherein said step of attaching the other side of said semiconductor wafer to a carrier substrate using thermoplastic material as an adhesive, further comprises the steps of:

coating the other side of said semiconductor wafer with thermoplastic material in the liquid state;

heating the thermoplastic coated semiconductor wafer to cure said thermoplastic material and form a solid thermoplastic coating;

pressing said side of said semiconductor wafer containing said solid thermoplastic coating against said carrier substrate and, while continuing said pressing, heating said semiconductor wafer and carrier substrate to the fusing temperature of said thermoplastic material, whereby said thermoplastic material liquefies;

cooling said semiconductor wafer and carrier substrate below said fusing temperature of said thermoplastic material whereby said thermoplastic material re-solidifies and bonds said semiconductor wafer to said substrate carrier.

13(original). The method of removing individual semiconductor chips from a semiconductor wafer as defined in claim 10, wherein said step of attaching the other side of said semiconductor wafer to a carrier substrate using thermoplastic material as an adhesive, further comprises the steps of:

placing a sheet of thermoplastic material on said carrier substrate;

Barsky et al.

doc. 12-1268

placing the other side of said semiconductor wafer on said sheet of thermoplastic material;

cutting said sheet of thermoplastic material in a line extending about the periphery of said semiconductor wafer to form a layer in the outline of said semiconductor wafer underlying said semiconductor wafer, and discarding the excess of said sheet outside said formed layer;

pressing said other side of said semiconductor wafer against said formed layer of thermoplastic material and through said formed layer against said carrier substrate and, while continuing said pressing, heating said semiconductor wafer and carrier substrate to the fusing temperature of said thermoplastic material, whereby said thermoplastic material liquifies;

cooling said semiconductor wafer and carrier substrate below said fusing temperature of said thermoplastic material whereby said thermoplastic material re-solidifies and bonds said semiconductor wafer to said substrate carrier.

14(original). The method of removing individual semiconductor chips from a semiconductor wafer as defined in claim 11, wherein said step of attaching the other side of said semiconductor wafer to a carrier substrate using thermoplastic material as an adhesive, further comprises the steps of:

coating the other side of said semiconductor wafer with thermoplastic material in the liquid state;

heating the thermoplastic coated semiconductor wafer to cure said thermoplastic material and form a solid thermoplastic coating;

pressing said side of said semiconductor wafer containing said solid thermoplastic coating against said carrier substrate and, while continuing said pressing, heating said semiconductor wafer and carrier substrate to the fusing temperature of said thermoplastic material, whereby said thermoplastic material liquifies; and then cooling said wafer, thermoplastic and carrier substrate to re-solidify said thermoplastic;

Barsky et al.

doc. 12-1268

15(original). The method of removing individual semiconductor chips from a semiconductor wafer as defined in claim 14, wherein said step of removing said photoresist further comprises chemically dissolving said photoresist; and wherein said step of removing said thermoplastic further comprises chemically dissolving said thermoplastic.

16(original). The method of removing individual semiconductor chips from a semiconductor wafer as defined in claim 15, wherein said wafer comprises sapphire.

17(original). The method of removing individual semiconductor chips from a semiconductor wafer as defined in claim 15, wherein said wafer comprises silicon carbide.

18(original). The method of removing individual semiconductor chips from a semiconductor wafer as defined in claim 15, wherein said semiconductor chips comprise Gallium Nitride.